

IN THE CLAIMS:

Claim 1 (Currently Amended) An article comprising:

a multi-layer substrate having a first and second layer and each having a thickness;

a support portion ~~that is~~ defined from said first layer and having a length and an actuating end, and rotatably coupled to, said multi-layer substrate; ~~and~~

an optical element portion coupled to and depending from an end of said support portion opposite said actuating end, said optical element having a length less than said length of said support portion and having a thickness substantially defined by said thickness of said second layer, said element portion is movable between:

a first position within said multi-layer substrate below an exterior surface thereof, and

a second position outside of said multi-layer substrate above said exterior surface thereof.

Claim 2 (Currently Amended) The article of claim 1 wherein said multi-layer substrate comprises ~~at a first layer, a second layer, and an intermediate layer separating said first layer and said second layer.~~

Claim 3 (Currently Amended) The article of claim [2] 1 wherein said support portion comprises a torsional member that is rotatably coupled to said ~~multi-layer substrate~~ first layer.

Claim 4 (Currently Amended) The article of claim 3 wherein said support portion further comprises a beam, wherein said optical element portion depends from said beam.

Claim 5 (Currently Amended) The article of claim 4 wherein a working surface of said optical element portion is physically adapted to receive an optical signal.

Claim 6 (Currently Amended) The article of claim 5 wherein said physical adaptation of said working surface ~~is that it is~~ reflective, and further wherein said working surface is substantially orthogonal to said exterior surface of said multi-layer substrate.

Claim 7 (Currently Amended) The article of claim 6 wherein:
said torsional member and said beam comprise a part of said first layer; and
said optical element portion comprises a part of said second layer.

Claim 8 (Currently Amended) The article of claim 7 wherein a height of said working surface of said optical element portion is defined by a thickness of said second layer.

Claim 9 (Original) The article of claim 8 wherein said first layer and said second layer comprise silicon.

Claim 10 (Currently Amended) The article of claim [9] 1 wherein said multi-layer substrate comprises a silicon-on-insulator wafer having a thin silicon layer overlying an insulating layer that overlies a thick silicon layer, and further wherein said thin silicon layer is said first layer; said insulation layer is said intermediate layer; and said thick silicon layer is said second layer.

Claim 11 (Currently Amended) The article of claim [4] 1 comprising:

wherein said actuating end is an actuating plate that depends from said beam; and

said article further includes an electrode disposed in spaced relation with said actuating plate,

wherein:

under ~~the~~ an action of an applied potential difference, said electrode is operable to cause said actuating plate to move ~~towards said second layer of~~ into said multi-layer substrate, which movement in turn causes said optical element portion to move towards said second position ~~outside of said multi-layer substrate.~~

Claim 12 (Currently Amended) The article of claim 11 further comprising a first waveguide and a second waveguide that are disposed in orthogonal relation to one another, wherein:

when said optical element portion is in said first position, said first waveguide and said second waveguide are in optical communication with one another; and

when said optical element portion is in said second position, said first waveguide and said second waveguide are not in optical communication with one another.

Claim 13 (Original) The article of claim 12 wherein said article is an optical cross connect.

Claim 14 (Currently Amended) An article comprising a support portion that is defined from at least [a] an outer first layer of a multi-layer substrate, said support portion having a length and an actuating end and an optical element portion coupled to and depending from said support portion and having a length less than a length of said support portion and being located at an end opposite said

actuating end, said optical element further having a thickness that is substantially defined from at least a by a thickness of an inner second layer of said multi-layer substrate, wherein[:]an interior of said multi-layer substrate is defined between a top surface of said first layer and a bottom surface of said second layer; and said optical element portion comprises a part of said second layer, wherein said at least a portion of said optical element portion is movable between a first position in said interior of said multi-layer substrate and a second position above said top surface of said first layer.

Claim 15 (Currently Amended) The article of claim 14 wherein a working surface of said optical element portion is physically adapted to receive an optical signal, and further wherein said working surface is disposed in orthogonal relation to said top surface of said first layer.

Claim 16 (Original) The article of claim 15, wherein a height of said working surface is defined by a thickness of said second layer of said multi-layer substrate.

Claim 17 (Currently Amended) An article comprising:

an array having n columns and n rows of optical elements that are disposed in and rotatably coupled to a first layer of a multi-layer substrate;

a first $1 \times n$ array of optical waveguides, wherein each one of said optical ~~waveguide~~ waveguides in said first array is aligned for optical communication with said optical elements in one of said n columns; and

a second $1 \times n$ array of optical waveguides disposed in orthogonal relation to said first

array of optical waveguides, wherein each ~~one of said~~ optical waveguide waveguides in said second array is aligned for optical communication with said optical elements in one of said n rows; wherein, each optical element comprises:

an element portion that is defined from at least ~~one~~ a second layer of said multi-layer substrate, said second layer having a thickness and said element portion having a thickness substantially defined by said thickness of said second layer ~~substrate~~, said element portion having an optical signal receiving surface that is disposed in orthogonal relation to a major surface of said multi-layer substrate;

a support portion having a length and defined from said first layer and rotatably coupled to said multi-layer substrate and that having an actuating end, and is coupled to said element portion having a length less than said length of said support portion and being coupled to and depending from said support portion at an end opposite to said actuating end, wherein said support portion allows said element portion to move independently of said multi-layer substrate; and

an electrode operable, under the action of an applied potential difference, to cause said element portion to move to between:

a first position wherein said element portion is within said multi-layer substrate; and

a second position ~~wherein said element portion is outside of said multi-layer substrate~~ wherein at least a portion of said element portion is above an exterior surface of said multi-layer substrate.

Claim 18 (Currently Amended) The article of claim 17 further comprising collimating/focusing lenses that are operable to collimate optical signals leaving said optical waveguides of said first and second arrays and to focus optical signals entering said optical waveguides.

Claim 19 (Original) The article of claim 17 wherein said multi-layer substrate comprises a silicon-on-insulator wafer having a thick silicon layer, a layer of oxide disposed on said thick silicon layer, and a thin silicon layer disposed on said layer of oxide.

Claim 20 (Original) The article of claim 19 wherein said element portion comprises a part of said thick silicon layer.

Claim 21 (Original) The article of claim 20 wherein said optical signal receiving surface of said element portion comprises facets having a $\langle 111 \rangle$ crystal orientation.

Claims 22-26 (Canceled)